

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1 IN RE: The application of Damian J. Walter

2 TITLE OF THE INVENTION

3 Automatic Dispenser for Underground Sprinkler Systems

4 CROSS REFERENCE TO RELATED APPLICATIONS

5 Not Applicable

6 STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH AND  
7 DEVELOPMENT

8 Not Applicable

9 BACKGROUND OF THE INVENTION

10 1. Field of the invention

11 This invention relates to automatic fertilizer systems and particularly to  
12 automatic fertilizer systems used with automatic sprinkler systems.

13 2. Description of the Prior Art

14 Underground sprinkler systems have been used for many years to water lawns.  
15 Typically, these systems use buried flexible PVC pipe to feed a number of sprinkler  
16 heads placed about a lawn. Alternatively, perforated pipe may be substituted for the  
17 sprinkler heads. In this case, the perforations disburse water into the ground directly  
18 watering a lawn.

19 One advantage of these systems is that fertilizer and other enhancements can be  
20 added directly to the water stream, thereby spreading these enhancements over the  
21 entire lawn during the watering process. One example of such a device is found in U.S.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1 Patent No. 6,230,987. This patent describes an applicator that allows a predetermined  
2 flow of a fluid for dissolving and distributing soluble substances that comprises a cap  
3 and a hollow cylindrical housing. The hollow cylindrical housing comprises of an  
4 enlarged chamber having a narrowed inlet port at its lower end. The narrowed inlet  
5 port has external threads connecting to a Tee pipe fitting of a pipeline of a fluid system  
6 and has a cylindrical flow channel extending to the enlarged chamber. The cylindrical  
7 flow channel has six equal V flow passages which are constructed by six vertical  
8 dividing walls locating at equal spaces around the wall of the cylindrical flow channel  
9 and extending inward to the axis of the cylindrical flow channel. The six equal V flow  
10 passages have six equal vertical openings, which are constructed by the vertical  
11 dividing walls and disposed outside the cylindrical flow channel of the narrowed inlet  
12 port at a predetermined length. The six equal vertical openings comprises of three  
13 vertical inlets and three vertical outlets. The six equal vertical openings have a same  
14 bottom wall, which is constructed, at the lower end of the vertical dividing walls. The  
15 same bottom wall has a diameter smaller than the minor diameter of the external  
16 threads of the narrowed inlet port. The system is designed so that when an user turns  
17 on his sprinkler system, the inventing applicator will precisely allow a predetermined  
18 portion of water in the horizontal flow channel of the Tee pipe fitting into the three  
19 vertical inlets 34 through their V flow passages 30 to the enlarged chamber 24 for  
20 mixing with and dissolving soluble substances at a predetermined flow ratio. A  
21 mixture, which is formed inside the enlarged chamber, flows through the other three V

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1 flow passages 30 of the three vertical outlets 34 and is diluted in a downstream flow of  
2 water in the horizontal flow channel of the Tee pipe fitting at a predetermined flow  
3 ratio. For more effective distribution of the soluble substances to any large areas of  
4 lawns, gardens, golf courses, vegetable fields, agricultural fields etc., the user may  
5 install the inventing applicators at equal distances along their sprinkler pipelines. This  
6 invention helps the user save time, labor and cost for dissolving and distributing the  
7 soluble substances into their sprinkler systems. While useful in certain applications it  
8 requires several units to distribute the solutions to different zones of a lawn or garden  
9 (i.e., one of the units is needed for each zone.)

10 Another device for distributing such enhancements is found in U.S. Patent  
11 application 2002/0145057. This application discloses a fertilizer-mixing device for  
12 sprinkler systems including a water inlet pipe having a water inlet, a first water outlet,  
13 and a second water outlet. The water inlet is in communication with an existing water  
14 source. A mixing chamber is adapted for holding a predetermined amount of fertilizer  
15 and water therein. The mixing chamber comprises a housing having a first opening  
16 therein for receiving the first water outlet of the water inlet pipe therein. The housing  
17 has a check valve disposed therein. The check valve includes an input pipe and an  
18 output pipe. A water outlet pipe is provided that has a first water inlet, a second water  
19 inlet, and a water outlet. The first water inlet is in communication with the second  
20 water outlet of the water inlet pipe. The second water inlet pipe is in communication  
21 with the output pipe of the check valve of the mixing chamber. The water outlet is

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1 connectable with an existing sprinkler system. Thus, this system allows water to enter  
2 the mixing chamber, where it mixes with the desired enhancements and then discharges  
3 back into the main flow line. Again, while this system works well of a single zone  
4 operation, there is no way to dispense fertilizer or other enhancements in balanced and  
5 measured amounts to different zones of operation.

6 BRIEF DESCRIPTION OF THE INVENTION

7 The instant invention overcomes these difficulties. The unit is an automatic  
8 fertilizer that is designed to be used with a yard/lawn sprinkler system; either with  
9 below ground or above ground zoned systems. This unit is placed between the  
10 backflow check valve and the zone valves of the sprinkler system. The unit is designed  
11 to disperse/drop fertilizer into a tank chamber below a discharge tray. The fertilizer  
12 then dissolves in the water and is distributed/dispersed to the appropriate sprinkler  
13 system zone. The discharge tray has multiple chambers based on the number of zones  
14 in the sprinkler system. The chambers in the discharge tray can hold various capacities  
15 based on the area covered by each zone within the sprinkler system. The discharge tray  
16 turns to dispense the fertilizer as the sprinkler system changes from zone to zone. The  
17 discharge tray is automatically moved by a mechanical device. The chambers are  
18 manually refilled based on the frequency of yard fertilization. The unit has an access  
19 from the top to the discharge tray for filling chambers with fertilizer material.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1 It is an object of this invention to produce an automatic dispenser for  
2 underground sprinkler systems that dispenses fertilizers and other enhancements to  
3 multiple zones from a single location.

4 It is another object of this invention to produce an automatic dispenser for  
5 underground sprinkler systems that can be used in a variety of locations, such as  
6 gardens, lawns, and other outdoor areas.

## BRIEF DESCRIPTION OF THE DRAWINGS

8 Figure 1 is a cross-sectional view of a first embodiment of the invention.

9 Figure 2 is an enlarged cross-sectional view of the dispensing chamber.

Figure 3 is an exploded view of the key components of the first embodiment.

11 Figure 4 is a cross-sectional view of a second embodiment.

12 Figure 5 is a plan view of the chamber of the second embodiment taken along the  
13 lines 5-5 of fig. 4.

14 Figure 6 is a plan view of the top neoprene disk of the dispensing system.

15 Figure 7 is a plan view of the bottom neoprene disk of the dispensing system,  
16 sized for an eight-chamber dispenser.

17 Figure 7a is a plan view of the bottom of the dispensing tray of the dispensing  
18 system, sized for an eight-chamber dispenser.

19 Figure 8 is a plan view of an eight-zone dispensing dish, as part of the dispensing  
20 system.

21 Figure 9 is a representational wiring diagram for the control system.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1       Figure 10 is an exploded view of the key components of an embodiment.

2                   DETAILED DESCRIPTION OF THE INVENTION

3       Referring now to fig. 1, a cross-sectional view of the first embodiment 1 is shown.

4       The major components of this embodiment are an agitation tank 2, a dispensing system

5       3 and a drive motor 4. The system 1 is typically placed in a sprinkler system between

6       the backflow check valve (not shown) and the zone valves (see fig. 9) of the sprinkler

7       system. In this way, the unit 1 can service all the zones from one location.

8       The tank 2 has a number of threads 10 formed about the outside of the top of the  
9       tank. The threads 10 are used to secure the lid of the dispensing system 3, as discussed  
10      below. As an alternative, latches can be used instead of the threads. The tank 2 has an  
11      inlet pipe 11 and an outlet pipe 12. The inlet pipe is positioned near the bottom of the  
12      tank. For example, in the preferred embodiment, the inlet pipe is placed about 1/2 inch  
13      (12mm) above the bottom of the tank to allow water to enter the tank at the bottom.

14      The exit pipe is positioned at a point just below the dispensing system. These locations  
15      ensure that the incoming water is thoroughly mixed within the tank. In the preferred  
16      embodiment, the tank 2 is a four-gallon tank. However, the exact size of the tank can  
17      vary.

18      A drainage pipe 13 is also provided to drain off water. This pipe is fitted with a  
19      drainage relief valve to drain off water when the unit is not being used and when the  
20      system is between zones. This reduces the pressure and the resistance of the water  
21      when turning the dispensing tray. Note that this drain mechanism must be adjusted

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1 based on the water pressure of individual locations. The drain mechanism can also be  
2 controlled electronically using a trigger valve or similar mechanism that is ties into the  
3 main system controller.

4 The dispensing system 3 is shown in cross section in figure 2. The system has an  
5 outer lid 15 that has threads 16 formed thereon. The threads 16 mate with the threads  
6 10 on the tank when the dispensing system 3 is placed in the tank and the lid 15 is  
7 screwed onto the top of the tank 2. Alternatively, a set of latches 50 can be used to  
8 secure the dispensing tray into the tank. The latches 50 are shown in fig. 10.

9 In the preferred embodiment, the case 15 has a neoprene top disk 17 (see also fig.  
10 6), and a neoprene bottom disk 18 (see fig. 7). Of course, rubber or a similar material  
11 can be used in place of the neoprene, if desired. A dispenser tray 19 (see fig 8) forms the  
12 body of the dispensing system. A bottom tray platform 20 (see fig. 7a) sits under the  
13 dispensing tray and the bottom neoprene disk 18. The bottom tray platform 20 is fixed  
14 in the tank.

15 As shown in figure 6 neoprene top disk 17 is a solid circle of material. The  
16 neoprene bottom disk 18 and a tray platform 20 (see fig. 3) have a pie-shaped area  
17 removed. This pie-shaped area conforms to the size of the individual compartments of  
18 the dispensing tray 19. Figure 8 shows a dispensing tray 19 with eight compartments.  
19 This is the preferred number of compartments because it can be used if fewer than eight  
20 zones are employed. Of course, trays having 4, 6, 10 or 12 compartments can be also  
21 used. However, these are not preferred because an eight-tray unit can dispense

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1 material to a smaller number of zones and having multiple section trays increases cost  
2 and inventory.

3 Referring again to fig. 2, the center of the dispensing tray 19 has a socket 22  
4 formed at the bottom of a center tube 21. In the preferred embodiment, the center tube  
5 is formed of PVC plastic. The socket 22 is formed of a stainless steel insert. A drive  
6 shaft 24 is placed in the center tube and is secured in the socket using ball bearings 25  
7 that fit into detents in the socket 22. This type of locking mechanism is common in the  
8 art and any similar type of locking mechanism can be used as well. As shown in fig. 2,  
9 the shaft 24 extends above the top of the dispensing tray 19. A rubber (or similar  
10 material) seal 26 is placed around the shaft as shown to seal the dispensing tray to  
11 prevent leaks. The top of the shaft 24 attached to the drive motor 4 (see fig. 1). The  
12 purpose and use of the drive motor 4 are discussed in detail below.

13 Figure 3 is a partially exploded view of the first embodiment 1. Here, the mixing  
14 tank 2 is shown separate from the dispensing system 3 and the motor 4. The view  
15 shows the shaft 24 positioned between the dispensing system 3 and the motor 4. The  
16 bottom neoprene gasket 18 is shown as well. This view also shows a junction box 27  
17 (see fig. 9) that is used to house the control wires, as discussed below.

18 Finally, this view shows the drain tube 13 located in an alternative position at the  
19 bottom of the tank. This view also shows that in the preferred embodiment, the drain is  
20 designed to drain into a layer of gravel 14 placed under the tank 2.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1        Finally, the tray platform 20 is shown in position. This platform is fixed in place.  
2        As the dispensing tray turns, the tray compartments align with the opening in the tray  
3        platform to dispense the fertilizer or other product.

4        Figure 4 is a cross-section of a second embodiment 30. This system is similar to  
5        the first embodiment in that it has a tank 31, a dispensing system 32, and a motor 33.  
6        The dispensing system 32 and a motor 33 are identical to those discussed in the first  
7        embodiment. The difference here is in the tank 31. In this embodiment, the tank has a  
8        slanted base 31a. The drain 34 is located in the center of the base as shown. The use of  
9        the slanted base allows for the creation of a settlement area at the bottom of the tank.  
10       The inlet port 35 and the outlet port 36 are similar to the first embodiment. In this view,  
11       the drop space 37 for the product is shown as a thin area adjacent to the bottom of the  
12       dispensing tray. In this embodiment, the tank has a preferred size of between about 3  
13       and 5 gallons.

14       Figure 5 is a plan view of the tank showing the inlet pipe 11. In the preferred  
15       embodiment, the inlet pipe is placed at a 90-degree angle so that as water enters the  
16       tank it moves about the inner wall of the tank. Note that the figure shows the water  
17       flow 101 entering the tank and following the sidewalls. In this way, the water entering  
18       the tank aids in swirling the tank contents to ensure complete mixing within the tank.

19       Figure 6 is a plan view of the top disk 17. This disk is generally solid except for a  
20       center hole to allow the shaft 24 to pass through. In the preferred embodiment, this  
21       disk is approximately 1/8 inch (3mm) to 1/2-inch (12) mm thick. Note that the top disk

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1      17 can be adhered to the underside of the lid 15, although it does not have to be. Figure  
2      7 is a view of the bottom disk 18. This disk is also approximately 1/8 inch (3mm) to  
3      1/2-inch (12) mm thick. Here, the disk has a wedge-shaped portion 18a cut out. In the  
4      preferred embodiment, the edges of the wedge-shaped portion 18a are reinforced to  
5      reduce tearing. The wedge-shaped portion 18a matches the size and shape of the  
6      compartments in the dispensing tray. Note that the bottom tray 18 can be adhered to  
7      the top of the tray platform, if desired.

8              The dispenser tray 19 is shown in plan view in fig. 8. In this view, the  
9      compartments are shown. Note that each compartment is formed by a number of  
10     retaining walls 19a that extend upward to form the compartments. The outer edges of  
11     the tray are sealed by an exterior wall 19b.

12              A tray platform 20 (see fig. 7a) sits under the dispensing tray and the bottom  
13     neoprene disk 18. Like the bottom disk 18, the tray platform 20 has a wedge-shaped  
14     area 20a removed.

15              Referring now to fig. 9, details of the control system are shown. The sprinkler  
16     system zone valve control panel 40 controls distribution of water to different zones by  
17     operating a series of zone valves 41. A main valve 42 is also shown. The main valve 45  
18     can be energized from the control panel 40 or from the junction box 27. In the figure,  
19     eight zone valves are shown. Of course, this number can vary depending on the size of  
20     the system. Also shown in the figure are the inflow pipe 11, the outflow pipe 12 and the  
21     unit 1 in place. The outflow pipe 12 is shown acting as a manifold for the eight zone

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1    valves in this system. Each zone valve has an outlet pipe **43** that feeds the sprinklers in  
2    each zone. The system is designed to switch the flow from zone to zone at regular  
3    intervals. Each zone valve is opened for a period of time to ensure adequate watering  
4    for each zone. The zone valves are connected to the control box **40** by wires **45** or their  
5    equivalent (such as a wireless connection). Figure 9 also shows a parallel set of wires **48**  
6    that extend from the controller to the junction box **27** mounted to the motor **4** on the  
7    unit **1**. These wires are connected to the drive motor controller. When a zone is  
8    activated, the motor turns the dispensing tray to the next position, where the contents of  
9    that particular compartment are allowed to fall (dispense) into the tank **2**. The system  
10   then stops the motor, even though the zone valve is still open. This allows time for the  
11   fertilizer or other enhancement to dissolve completely and to disburse through the  
12   sprinklers in the zone. Once the proper timing sequence has been completed, the  
13   system shifts to the next zone and the process is repeated. In this way, all zones are fed  
14   with the fertilizer or other enhancements in a balanced manner automatically.

15       The timing of the cycle depends on the water pressure and the material to be  
16   mixed. For example, at water pressures of 35 psi or less, it takes seven minutes for the  
17   material to dissolve and two minutes for it to be thoroughly disbursed through the  
18   zone. At water pressures above 35 psi, it takes four minutes to dissolve the material  
19   and two minutes to disburse the material though a zone.

20       Figure 9 also shows an optional main control valve **42**. This valve is used to shut  
21   down water flow when the device is switching zones. This allows the tank to drain,

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

1 and, as discussed above, makes turning the dispensing tray easier. The valve is timed  
2 to open so that the system can operate in an optimal fashion.

3 Figure 10 is a detail view of an embodiment of the device in which the threads on  
4 the dispensing tray and tank have been replaced with latches 50. The latches are  
5 common to the art and are placed about the perimeter of the tank and dispensing tray  
6 as desired. As shown, a minimum of two latches 50 is required.

7 The present disclosure should not be construed in any limited sense other than  
8 that limited by the scope of the claims having regard to the teachings herein and the  
9 prior art being apparent with the preferred form of the invention disclosed herein and  
10 which reveals details of structure of a preferred form necessary for a better  
11 understanding of the invention and may be subject to change by skilled persons within  
12 the scope of the invention without departing from the concept thereof.